SECTION 05121

STAINLESS STEEL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, apply to this Section.

1.2 DESCRIPTION

A. This specification includes technical requirements for furnishing, detailing, fabricating, and installing stainless steel liners, embedments, plates, bars, and shapes in accordance with this specification and the design drawings.

1.3 RELATED WORK

A. Division 3, Section 03300, “Cast-In-Place Concrete” for stainless steel embedments and liner plates.

1.4 REFERENCES

A. ASTM A-36-94, Standard Specification for Carbon Structural Steel.

B. ASTM A-240-94a, Standard Specification for Heat-Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels.

C. ASTM A-312-92a, Standard Specification for Seamless and Welded Austenitic Stainless Steel Pipes.

D. ASTM A-479-94a, Standard Specification for Stainless and Heat-Resisting Steel Bars and Shapes for use in Boilers and other Pressure Vessels.

E. ASTM A-480-94, Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet and Strip.

F. ASTM A-484-94a, Standard Specification for General Requirements for, Stainless and Heat-Resisting Steel Bars, Billets and Forgings.

G. ASTM A-530-92a, Standard Specification for General Requirements for Specialized Carbon and Alloy Pipe.

H. ASTM A-666-94, Standard Specification for Austenitic-Stainless Steel Sheet, Strip, Plate, and Flat Bar.

I. FED-STD-183C, Federal Standard-Continuous Identification Marking of Iron and Steel Products.

1.5 SUBMITTALS

A. Duplicate samples of stainless steel with specified finishes shall be submitted to the Construction Manager for approval. Samples of finished butt and fillet weld surfaces shall be submitted for approval. Installed material shall match these approved samples.

B. Submit copies of shop drawings. to the Construction Manager for approval. Show dimensions, sizes, thicknesses, gages, finishes, joinings, attachments, and the relationship of work of this subsection to adjoining constructions. All work shall be fabricated and erected in accordance with the approved shop drawings. The arrangement of liner sheets shall minimize the total number of sheets consistent with the typical details on the drawings. Show all details of liner embedments including the complete support system for embedments in slabs. The liner embedment support system in slabs shall maintain the embedment system rigidly in place with no movement during the concrete construction. See Subparagraph 3.1 J. 1. for the alternative method of liner, embedment installation that is integral with the formwork.

C. All stainless steel materials shall be supplied with mill furnished Certified Material Test Reports (CMTR) identifying the material as 304L with a maximum carbon content of 0.030% ladle analysis for each heat of material used in fabrication and construction. Material certifications shall be submitted to the Construction Manager for approval. Certification test or heat lot markings shall correlate with the actual material identification markings prior to material usage.

1.6 DELIVERY

A. Suitable protection including covers, interleaving, and blocking shall be provided for all components during shipping and handling to prevent contamination or damage.

B. Components delivered to the site shall be stored off the ground in a sheltered dry area. Alternate means of protecting stainless steel shall be approved by the Construction Manager.

C. Certified Type 304L stainless steel shall be segregated from carbon steel and other stainless materials.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Materials shall conform to the following ASTM requirements:
   1. Plate, sheet, and strip shall conform to ASTM A-240 Type 304L, of thickness as indicated on the design drawing, and shall be furnished hot-rolled, annealed and pickled with the following finishes. Minimum yield strength shall be 30 ksi. Material shall be marked in accordance with ASTM A-480 and FED-STD-183C.
      a. Plate finish shall be No. 1 finish.
      b. Sheet finish shall be No. 2B finish.
      c. Strip finish shall be No. 2 finish.
   2. Bars and shapes shall conform to ASTM A-479 Type 304L and shall be cold finished, annealed, and descaled. Finish shall be at least No. 1. Shapes shall also be subjected to Class C surface preparation. Material shall be marked in accordance with ASTM A-484 and FED-STD-183C.
   3. Embedded stainless steel pipe sleeves shall conform to ASTM A-312 Type 304L, seamless or welded. Material shall be marked in accordance with ASTM A-530 and FED-STD-183C.

4. Flat bar shall conform to ASTM A-666 Type 304L and shall be cold finished annealed and descaled. Finish shall be at least No. 1. Material shall be marked in accordance with ASTM A-480 and FED-STD-183C.

B. Filler metal shall be compatible with the specific base metal and shall be in accordance with the qualified welding procedures, see Division 18, Section 18100A, “General Welding Requirements.”

C. Items shown on design drawings as carbon steel shall conform to ASTM A-36.

PART 3 - EXECUTION

3.1 INSTALLATION / APPLICATION / ERECTION

A. Material greater than 6 in. long and 1/2 in. wide shall be permanently marked on the side exposed to view (after installation) to permit verification of material certification. Marking shall be by electroetching prior to cutting from base stock. Documentation showing traceability from the permanent markings to the certified heat run number shall be submitted to the Construction Manager.

B. Welding of stainless steel shapes, liner plate and sheet, welding operators, and welders qualifications shall be as specified in Section 18100A.

C. No preheating of metal is required. The base metal shall be at a temperature of at least 65°F before welding is started. The maximum interpass temperature shall not exceed 350°F when welding stainless steel materials.

D. All welds potentially exposed to the contaminated water shall be full penetration, unless otherwise noted on the design drawings. The filler metal shall be deposited so as to give a smooth, uniform, and continuous bead as flush as practicable with the surface of the base material. The completed weld shall be ground smooth to at least a 64 RMS finish and wire brushed.

E. Visually examine all welds per Section 18100A. Vacuum box leak test all welds acting as a leak boundary per Section 18100A. Substitute liquid penetrant examination per Section 18100A for the vacuum box leak test for leak boundary welds which the Subcontractor, CM and the FM's oversight inspector jointly agree are impractical to vacuum box leak test.

F. All discoloration of finished surfaces due to welding shall be removed by mechanical cleaning. All weld spatter and welding oxides on finished surfaces shall be removed by a blasting or grinding process. Use of regular steel wool or other iron containing abrasive shall be prohibited.

G. Grinding of stainless steel shall be done where indicated on the drawings and only with new (unused) wheels and compounds, free from exposure to halogenated materials. Grinding wheels and other disposable tools to be used for stainless steel shall be uniquely marked and controlled to prevent their use on anything else other than stainless steel.

H. After being ground or where subjected to severe forming operation, stainless-steel surfaces shall be cleaned of all extraneous material, thoroughly rinsed with clean water, and dried. All lubricants and cleaners used in the fabrication of stainless steel shall be approved by the Construction Manager. Submit cleaning procedure to Construction Manager for approval.

I. A detailed liner installation plan shall be furnished for approval. The plan shall include the procedures to ensure the liner/embedment system installation meets the installation

tolerances. The plan shall include the procedure for measuring liner bowing between embedments. Liner plate or embedment installations that do not meet required tolerances shall be removed and replaced by the Subcontractor at the Subcontractor's expense.

J. Field Installation

1. Stainless steel liner sheeting is normally installed by "Wall paper" method. Other methods are allowed upon written approval from the Construction Manager. For the "wallpaper" method, the liner sheets shall be welded to the embedments after concrete placement. Liners shall be installed as one of the final steps in construction to minimize contamination and abrasion of the surface. As a primary alternative method, liner sheets could be welded to the embedments, and the welded assembly is in turn attached to the formwork prior to concrete placement. See Technical Specification Section 03300, “Cast-In-Place Concrete.”
2. Installed work shall be carefully protected against disfiguration, contamination, or damage by mechanical abuse or contact with harmful materials.
3. Intersections of embedments shall be made continuous by using penetration welds between sections. Backup bars or embedments shall be placed behind all liner welds.
4. Wall embedments shall be securely fastened flush against the inside face of the formwork.
5. Slab embedments shall be struck off and finished to flat surface between the face of the liner embedments.
6. Installation tolerances shall be:
   a. Wall embedment location shall be within +1/4 in.
   b. Slab embedments plan location shall be within +1/4 in.
   c. Slab embedments system shall be installed to true planes within 1/8 in. in 10 ft as determined by laying a 10 ft straight edge anywhere across the embedments in any direction.
   d. Wall liner plates: Liner plate bowing away from the planar surface between embedments shall not exceed 1/8 in. except as noted otherwise herein.
   e. Slab liner plates: Liner plate bowing away upward from the planar surface between embedments shall not exceed 1/8in. Liner plate bowing downward from the planar surface between embedments shall follow the finished concrete surface, see Technical Specification Section 03300, “Cast-in-Place Concrete.”
7. Square butt welds specified on liner installation drawings shall allow a 1.5 T root gap spacing between liner plates for complete weld penetration to the backing bar/angle. (T = material thickness.)

3.2 ADJUSTING AND CLEANING

A. Upon completion of installation and with approval of the Construction Manager, all work shall be cleaned of all protective .wrappings, soil, discoloration, and disfiguration.

B. The exposed liner surfaces shall be thoroughly cleaned using unused acetone or other solvents which have no halogens. Usage of all solvents shall follow the manufacturer's instructions or fire protection/prevention and ventilation requirements. All surfaces shall be thoroughly rinsed with clean water immediately after cleaning and dried. The surfaces shall be visually clean, dry, and grease-free.

C. Cleaning shall not be undertaken until all construction is completed within the prescribed areas.

D. The openings (drains, inlets, etc.) shall be plugged during cleaning and shall be flushed thoroughly with clean water immediately after cleaning.

E. Extra careful cleaning and drying shall be exercised for corners and crevices because of dirt, grease, and other foreign matter which may be trapped therein.

END OF SECTION 05121